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Border Effects as a Determinant of Commodity Groups Trade Flows between Iran and Korea*

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The aim of this paper is firstly to review the historical data on the bilateral trade relations between Iran and Korea. The disaggregated data for bilateral trade on commodity groups among Iran and its 33 major partners have been used during 1992-2015, using PPML approach. The results show that the border effects have had the most effect on the commodity sections 12, 13 and 11 according to the distance and international trade costs. Also, the potential trade ranks in commodity groups have represented that sections 6, 4 and 15 have the highest rank to promote bilateral trade between Iran and Korea.

JEL Classification: C14, C23, F13, F14
Keywords: border effect, gravity equation, PPML approach, Iran, Korea

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1. INTRODUCTION

Generally, the major progress has significantly decreased international transportation costs during recent decades, and by creating a global network for the transit of goods, and a modern type of the Silk Road has emerged due to demand for goods and services. Also, in today's world, due to the global production network of industrial goods and aspect of the intra-industry trade, the industries experience different structure and characters. Hence, believing in the importance of the resource endowments as an important factor to create comparative advantage have been seriously doubted and, the consumer preferences, institutions, and traditions have determined as major factors for world trade patterns (Romalis, 2004; Levchenko, 2007; Chor, 2010).

Moreover, Leamer (2007) mentioned that "There is very little that economists fully understand about the global trade but there is one thing that we do know — commerce declines dramatically with the distance." The negative impact of distance on trade is indeed one of the most robust findings in international economics (Leamer, 1993; Frankel, 1997; Disdier and Head, 2008). However, trade is not only reduced by distance, also international borders display negative effect in this regard (McCallum, 1995; Wei, 1996; Anderson and van Wincoop, 2003; Obstfeld and Rogoff, 2001; Coughlin and Novy, 2012). Also, adjacent countries can experience more trade than non-adjacent ones (Leamer, 1993; J. F. Helliwell, 1997), leading to the so-called adjacency or contingency effect. Consequently, intra-national/continental trade is more than international/ continental trade.

Hence, these results lead to several empirical studies about gravity equation which it has estimated for various kinds of trade models based on either assuming perfect competition (J. E. Anderson, 1979; Deardoff, 1995; Eaton and Kortum, 2002), monopolistic competition (Bergstrand, 1989; Bergstrand, 1990) or a demand system with translog preferences (Novy, 2013). Furthermore, the

critical role of distance and borders as determinants of bilateral trade flows can be described by a suitable variable which it reflects a variety of barriers to trade. Distance and border effects consider not only for the geographical barriers of bilateral trade, but also various costs of trade may experience during transporting a good to the ultimate purchaser. For example, Anderson and van Wincoop (2004) surveyed the relationship between geographical distance and trade costs. In addition, Blum and Golfarb (2006) argued that distance may change consumers' preferences since it decreases trade even in online products with zero trade costs.

The aim of this paper is firstly to review the historical data of Iran's international trade, especially focusing on the bilateral trade relations between Iran and Korea. Then, the determinants of bilateral trade between Iran and its major partners will be evaluated with emphasizing on *Border Effects* using the relevant disaggregated data of trading commodities. Finally, this study tries to rank the potential trade for commodity groups between Iran and Korea and present some suggestions for promoting bilateral trade flows between two partners. The disaggregated data for bilateral trade on commodity groups among Iran and its 33 major partners (including Korea) have been used during 1992-2015. Some measure such as export-import similarity index, inter and intra-industry trade index, horizontal and vertical intra-industry trade index are employed to achieve the purposes of this paper. Additionally, the specified gravity model is estimated by the PPML approach to explore the role of border effects in Iran-Korea trade relations.

The remainder of the paper is organized as follows. Section 2 provides a brief literature review. The realized facts about Iran-Korea trade flows have been represented in section 3. The econometrics model and methodology will be introduced in section 4. Section 5 analyzes the empirical results. Finally, some concluding remarks and policy implications are reported in section 6.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEWS

Generally, Tinbergen (1962) and Pöyhönen (1963) are the first authors to introduce the gravity model to international trade literature. Basically, this model suggests that bilateral trade flows of countries are associated with the gravitational force between two items where it is directly associated with the size of countries and inversely linked to the distance between them. However, the empirical researches in this area have not been strongly supported by theoretical literature until the second half of the 1970s when many theoretical improvements have introduced in verify of the gravity model. For example, Anderson (1979) assumed a model of differentiated products and tried to derive the gravity equation. Also, with simple monopolistic competition models, Bergstrand (1985; 1989) introduced the theoretical determinants of bilateral trade flows in gravity equations associated with these models. Using a differentiated product model with increasing returns to scale, Helpman and Krugman (1996) tried to explain the gravity model. Deardorff (1995) showed that the gravity equation is applicable for modeling of many international events including commodity flows, capital flows, and labor force movements and can be verified from normal trade theories.

Hence, the augmented gravity model of trade indicates that the volume of exports between pairs of countries, is related to their incomes (GDPs), their populations, their geographical distance and a set of dummies. Also, the technology could modify the impact of geographical limitations on trade, but the estimated results of normal gravity model have not confirmed that the sensitivity of trade to distance has been reduced over time, as far as the missing globalization puzzle is concerned.

In following, the role of cross-country differences including relative factor endowments and relative country size as determinants of the trade volume has

been investigated by Suárez-Burguet *et al*. (2005). The authors developed and introduced a model based on Helpman and Krugman (1996) to determine how the volume of trade can be affected by trade barriers, as well as "soft" investment in infrastructure. The model supports the idea that international trade flows is determined by comparative advantage and then tried to add factors with a positive effect on production factors which they are namely "soft" (technological innovation) investment in infrastructure. Although the benefits of increased trade are reduced by the resistance imposed by geographical barriers, infrastructure endowment determines countries' specialization and trade flows.

2.1. The Role of Distance in Gravity Models

Generally, with the seminal contribution of McCallum (1995), a large and still growing literature on the trade-reducing effects of inter- and intra-national borders has emerged. For evidence on international borders, the theoretical and empirical literature in this regard is Wei (1996); Helliwell (1998); Hillberry (1999); Head and Mayer (2000); Nitsch (2000); Anderson and van Wincoop (2003) and Chen (2004). Also, evidence on the intra-national home bias is provided for example by Wolf (2000); Hillberry and Hummels (2003); Combes *et al*. (2005); Millimet and Osang (2007) as well as Yilmazkuday (2012), while Nitsch and Wolf (2013), as well as Felbermayr and Gröschl (2014), emphasize the importance of defunct historical borders at the sub-national level. Three competing explanations for the trade-inhibiting effect of borders in terms of "political barriers", "statistical artifacts", or "fundamentals" exist within the literature. Thereby, Wei (1996), Hillberry (2002) as well as Head and Mayer (2000) show that the trade reducing effect of international borders cannot be explained through tariffs, quotas, exchange rate variability, transaction costs, or regulatory differences. Chen (2004) confirms the irrelevance of non-tariff

barriers but also finds that border effects are increased through technical barriers to trade and product-specific information cost.

Alternatively, Head and Mayer (2002) as well as Hillberry and Hummels (2008) show that border effects are inflated by the miss-measurement of internal distances, while the role of aggregation bias in explaining the trade-reducing effect of intra-national borders is highlighted by Hillberry (2002) and Hillberry and Hummels (2003; 2008). Evidence in favor of the "fundamentals" hypothesis is provided by Combes *et al*. (2005); Garmendia *et al*. (2012) as well as by Nitsch and Wolf (2013), who stress the importance of business and social networks. The role of cultural affinity and limited trust is highlighted by Felbermayr and Gröschl (2014). Thus, the overall evidence in favor of an explanation in terms of "political barriers" seems fairly limited.

Moreover, gravity models of trade use distance between countries as a proxy for transportation costs, assuming that transportation costs from the exporter country to the importer country are the same as transportation costs from the importer to the exporter country ($t_{ij}=t_{ji}$). However, Anderson and van Wincoop (2004) emphasize the need to obtain better transportation cost measures and to use these measures to expand gravity models and deal with the endogeneity of the transportation cost variable in gravity equations. Geographical distance may represent a series of factors such as cultural proximity, a shared history, a perception of closeness and information costs rather than acting as a proxy for transportation costs, since they tend to be fixed according to the supply and demand conditions in the market (Márquez-Ramos *et al*., 2006).

Empirically, as Anderson and van Wincoop (2004) argued, trade costs are often associated with a distance in this literature. Specifically, Limao, and Venables (2001) and Hummels (2001) suggested that the functional form of the relationship between trade costs and distance approximately can be shown by t_{ij} $=\text{DIST}^{\delta}$, where an estimate of $\delta=0.3$ is found. Such an approach is also supported by a large part of the related literature surveyed in Anderson and van

Wincoop (2004). To assess the importance of trade frictions, Anderson and van Wincoop (2003) recommend modeling multilateral resistance explicitly. In contrast, Feenstra (2002; 2016) suggests controlling for country-specific fixed effects and Rose and van Wincoop (2001) adopted this method. This approach obtains a consistent estimate of the average effect of trade frictions and is computationally simple. Similarly, Baier and Bergstrand (2001) provide a computationally simple approximation of the Anderson and van Wincoop (2003) model based on a Taylor-series approximation.

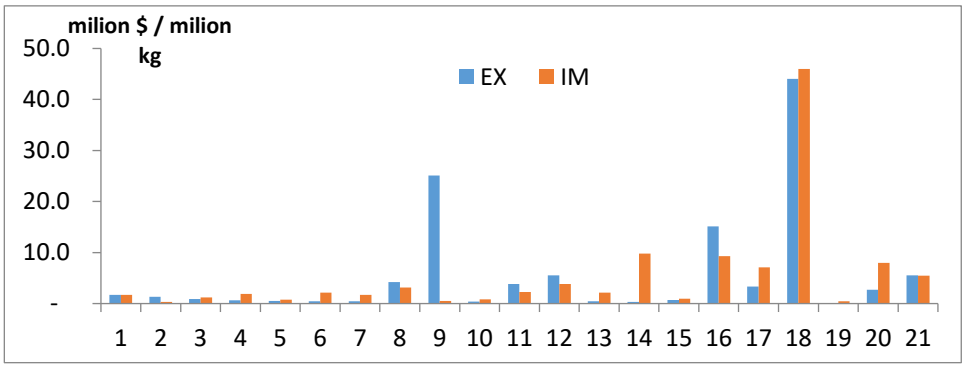
3. REALIZED FACTS

In this section, some realized facts and historical information about the Iranian trade flows will be introduced by focusing on the bilateral trade flows between Iran and Korea. In figure 1, the unit value of Iran-Korea trade flows in different commodity groups have been shown during 1992-2015. According to Figure 1, the highest unit value index has happened in section 18 for both export and import. Hence, this section is important for both countries.

Furthermore, as a traditional way of determining the degree of complementarity between two countries, empirical research tries to examine the level of similarity or dissimilarity in the structure of export and imports. COSINE measure (Cosin Index) is one of the measures to estimate complementarity of trade between pairs of countries which is developed by Linnemann (1966). The formula for Export-Import Similarity (EIS) and Import-Export Similarity (IES) indices are same and can be written as:

$$\text{Cosin Index}= \frac{\sum_k X_{ik}M_{jk}}{\sqrt{\sum_k X_{ik}^2}\sqrt{\sum_k M_{ik}^2}} \quad (1)$$

Figure 1 Iran - Korea Trade Flows (Unit Value), 1992 - 2015[1)]



where the variables X and M refer to exports and imports respectively and the subscripts i, j and k refer to exporting country, importing country and commodity groups respectively.

The value of the measure lies between 0 and 1 where the movement from 0 to 1 is a sign of the increasing trade complementarity between two countries. Also, the Cosin index could be considered as a measure of competitiveness between the two countries. The lower value of the Cosin index would imply that the two countries have potential competitiveness rather than potential complementarity.

Finger-Kreinin measure (FK Index) is as an alternative method to measure the similarity between the export-import structures of two countries, in which its formula is:

$$\text{FK Index} = \sum_k \min\left(\left[\frac{X_{ik}}{\sum X_{ik}}\right], \left[\frac{X_{jk}}{\sum X_{jk}}\right]\right), \tag{2}$$

where i and j are two countries and k is traded by disaggregated commodity.

[1)] See appendix A for the name of commodity sections.

The first ratio is the share of product *k* in country *i*'s total exports and the second ratio is the share of commodity *k* in country *j*'s total exports. If these shares are equal, then the ratio in the formula would sum to one, representing perfect similarity. On the other hand, if they are totally different, the index would be zero. Thus, the range of index is from zero to one.

Hence, based on calculated EIS (IES) and KF measures, Low Potential shows Poor Complementarity; Moderate Potential shows Partial Complementarity, and High Potential shows Perfect Trade Complementarity.

The results for different commodity groups' trade between Iran and Korea have been reported in table 1 where the Cosin and FK indices have been calculated, and the average of these indices has been computed. The calculated indices indicate that the average is very low and hence, potential trade in all commodity groups is low. However, this situation is different in some sections.
Moreover, Intra-industry (IIT) is a key index to promote bilateral trade between countries. Fontagne and Freudenberg (1997) argued that three types of bilateral trade flows could happen between countries: inter-industry trade, vertical IIT, and horizontal IIT. It should be mentioned that the prevalent method to calculate the IIT is introduced by Grubel and Lloyd (GL) (1971). However, the traditional GL index has aggregation bias as one major problem. Also, the unadjusted GL index is negatively associated with a large overall trade imbalance, and with national trade balances, the level of IIT in a country will be underestimated. Grubel and Lloyd (1975) suggested an alternative technique to adjust the index where the relative size of exports and imports of a specific good within an industry are used as weights. Hence, the formula of augmented GL index is as follows:

Table 1 The Results for Cosin and FK Indices in Different Commodity Groups

Section	Cosin Index							FK Index							Potential Trade
	2010	2011	2012	2013	2014	2015	Average	2010	2011	2012	2013	2014	2015	Average	
01	0.023	0.034	0.000	0.064	0.061	0.049	0.014	0.030	0.031	0.000	0.104	0.027	0.037	0.015	**LP**
02	0.000	0.003	0.000	0.000	0.045	0.057	0.005	0.002	0.018	0.004	0.002	0.036	0.029	0.004	**LP**
03	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.002	**LP**
04	0.028	0.087	0.063	0.020	0.025	0.022	0.030	0.022	0.061	0.056	0.033	0.027	0.021	0.025	**LP**
05	0.035	0.654	0.087	0.013	0.024	0.001	0.037	0.069	0.275	0.073	0.043	0.048	0.006	0.030	**LP**
06	0.060	0.039	0.047	0.064	0.133	0.040	0.029	0.049	0.050	0.035	0.054	0.100	0.041	0.025	**LP**
07	0.025	0.082	0.073	0.204	0.068	0.022	0.028	0.028	0.064	0.044	0.081	0.048	0.020	0.024	**LP**
08	0.004	0.033	0.015	0.000	0.000	0.000	0.018	0.005	0.037	0.014	0.000	0.000	0.000	0.013	**LP**
09	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	**LP**
10	0.082	0.001	0.005	0.000	0.001	0.000	0.011	0.082	0.002	0.007	0.000	0.001	0.000	0.013	**LP**
11	0.076	0.075	0.036	0.059	0.009	0.003	0.030	0.061	0.037	0.024	0.044	0.009	0.003	0.027	**LP**
12	0.000	0.189	0.000	0.000	0.000	0.000	0.011	0.000	0.166	0.000	0.000	0.000	0.000	0.010	**LP**
13	0.040	0.072	0.061	0.077	0.140	0.042	0.028	0.052	0.069	0.048	0.046	0.064	0.051	0.026	**LP**
14	0.000	0.011	0.000	0.000	0.000	0.000	0.001	0.000	0.005	0.000	0.000	0.000	0.000	0.000	**LP**
15	0.102	0.338	0.180	0.036	0.033	0.027	0.035	0.099	0.159	0.094	0.059	0.057	0.049	0.030	**LP**
16	0.051	0.020	0.021	0.306	0.293	0.014	0.040	0.052	0.044	0.023	0.113	0.138	0.018	0.022	**LP**
17	0.046	0.117	0.090	0.013	0.011	0.094	0.034	0.036	0.091	0.073	0.032	0.021	0.062	0.028	**LP**
18	0.026	0.011	0.059	0.006	0.014	0.000	0.013	0.057	0.018	0.091	0.010	0.016	0.000	0.014	**LP**
19	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
20	0.003	0.003	0.000	0.000	0.000	0.139	0.016	0.007	0.007	0.000	0.000	0.000	0.038	0.013	**LP**
21	0.234	0.000	0.000	0.000	0.000	0.000	0.035	0.141	0.000	0.000	0.000	0.000	0.000	0.026	**LP**

Notes: Three cut-off points: i) Low Potential (LP) for a range of more than 0.001 but less than 0.250; ii) Moderate Potential (MP) for a range of more than 0.250 but less than 0.550; and iii) High Potential (HP) for a range between 0.550 to 1.00.

$$GL_{ij}=\frac{\sum_k\left(X_{ij}^k+M_{ij}^k\right)-\sum_k\left|X_{ij}^k-M_{ij}^k\right|}{\sum_k\left(X_{ij}^k+M_{ij}^k\right)}, \quad (3)$$

where X and M are export and import between country i and j respectively, k is industry and $w_j=(X_{ij}^k+M_{ij}^k)/\sum_k\left(X_{ij}^k+M_{ij}^k\right)$ is as an industry weight.

Finally, Vertical IIT is Trade in products distinguished by quality and price (e.g., exports of high-quality clothing and imports of lower-quality clothing):

$$\frac{UV_{ijk}^X}{UV_{ijk}^M}>1+\alpha \qquad \text{or} \qquad \frac{UV_{ijk}^X}{UV_{ijk}^M}<1-\alpha, \quad (4)$$

where UV is the unit value of export and import. About α, Greenaway and Milner (1986) and Fontagne and Freudenberg (1997) suggest α=0.25 and α=0.15, respectively.

The results for Inter and Intra Industry trade, between Iran and Korea in different commodity groups have been represented in table 2 during 1992-2015. The first column in table 2 shows the observations in each commodity groups. Also, the second and third columns show the percentage on inter and intra-industry trade in each commodity section, for example, 100 percent of trade in section7 is intra-industry trade while 96 percent of trade in section 14 is an inter-industry trade. Finally, in the fourth column, the average of intra-industry trade has been calculated by GL measure in each section during 1992-2015. The results show that the highest value for intra-industry trade has been occurred in section 6, while it is lowest in section 14, 17 and 21. In overall, the average of intra-industry trade is 0.0133 for total trade flows in all commodity sections between Iran and Korea during 1992-2015 where it is very low.

Table 2 Inter and Intra Industry Trade between Iran and Korea in Commodity Groups, 1992-2015

Section	Observation	Intra-Industry Trade (Percentage)	Inter-Industry Trade (Percentage)	Average of Intra-Industry Trade (1992-2015)
01	20	55	45	0.355
02	22	82	18	0.259
03	22	14	86	0.162
04	24	92	8	0.352
05	24	96	4	0.206
06	24	96	4	0.555
07	24	100	0	0.031
08	21	43	57	0.271
09	19	42	58	0.148
10	24	63	37	0.005
11	24	100	0	0.023
12	17	12	88	0.020
13	24	96	4	0.102
14	24	4	96	0.001
15	24	100	0	0.146
16	24	83	17	0.003
17	24	83	17	0.001
18	24	58	42	0.005
19	na	na	na	na
20	24	46	54	0.004
21	16	54	46	0.001
Total Average				**0.0133**

Also, table 3 shows the results for horizontal and vertical IIT between Iran and Korea in different commodity groups during 1992-2015. Again, in the first column, the intra-industry trade observations have been shown. The second and third column shows the results for horizontal and vertical intra-industry trade for each section where α has taken two critical values (α=15 and 25%). According to the results, we can briefly claim that a major part of a trade between Iran and Korea in each section was a vertical intra-industry trade. Generally, the average of vertical intra-industry trade for total trade in all commodity groups between Iran and Korea was nearly 90 percent.

Table 3 Intra-Industry Trade, Horizontal and Vertical IIT between Iran and Korea in Commodity Groups, 1992-2015

Section	Intra-Industry Trade (Observation)	Horizontal Intra-Industry Trade (Percentage)		Vertical Intra-Industry Trade (Percentage)	
		α =0.25	α=0.15	α=0.25	α=0.15
01	11	45	18	55	82
02	18	6	0	94	100
03	3	0	0	100	100
04	22	9	5	91	95
05	23	0	0	100	100
06	23	17	13	83	87
07	24	0	0	100	100
08	9	0	0	100	100
09	8	0	0	100	100
10	15	13	0	87	100
11	24	12	4	88	96
12	2	0	0	100	100
13	23	0	0	100	100
14	1	0	0	100	100
15	24	21	17	79	83
16	20	20	20	80	80
17	20	20	10	80	90
18	14	29	21	71	79
19	na	na	na	na	na
20	11	18	9	82	91
21	5	0	0	100	100
Average		11	6	89	94

4. MODEL, DATA, AND METHODOLOGY

Generally, most models of international trade now derive an aggregate bilateral demand system that can be written as a form of the original gravity equation. Following the notation of Head and Mayer (2013), the general gravity model is written as:

$$X_{ij} = GS_i M_j \phi_{ij} \ , \tag{5}$$

where X_{ij} denotes nominal exports from country i to j, G is a gravity constant, S_i and M_j are the capabilities of exporter and importer respectively, and ϕ_{ij} is a function of the impact of trade barriers to bilateral trade flows, with $0 \leq \phi_{ij} \leq 1$. Using homothetic budget shares and general equilibrium market clearing conditions for the exporter, one can derive a structural basis for eq (6), so that:

$$X_{ij} = \frac{Y_i}{P_i} \frac{X_i}{\Pi_i} \phi_{ij} \ , \tag{6}$$

where Y_i is the gross output of exporter i, X_j is the total consumption value of goods in country j, P_i and Π_i are multilateral trade resistance terms (MTR). It should be mentioned that Anderson and van Wincoop (2003) enforce $X_i = Y_i$ (balanced trade) and $\phi_{ij} = \phi_{ji}$ (symmetric trade costs), which leads to $P_i = \Pi_i$ as a unique solution to their system of market clearing conditions. Subsequently, in most empirical applications, Y_i and X_j are proxied by exporter's GDP and importer's GDP respectively.

However, the bulk of theory in the gravity literature is related to static and cross-sectional models. At the same time most empirics are performed in a panel setting, and this for two main reasons: i) there is plenty of panel data available at the country level and even at the sector or product level; and ii) using time-invariant regressors (such as distance and borders) can infer causation of the model with respect to predicted trade flows. Although there is some work on dynamic panel models in international trade, for instance, Harris and Matyas (2004); Harris *et al*. (2009); and Baltagi *et al*. (2014), even in panel settings almost all the estimated models are still static, not dynamic.

Moreover, one of the main problems with the traditional log-linearization of the gravity model equation is that the data usually contain many zero values.

This may arise from missing values or represent genuine instances of zero trade between country-pairs. The common solution of omitting the zero trade observations leads to selection bias (Santos Silva and Tenreyro, 2006; Disdier and Head, 2008). Santos Silva and Tenreyro (2006) also point out that the log-linearization of the gravity equation leads to biased coefficient estimates in the presence of heteroscedasticity. They propose the use of a PPML model which, by avoiding log-linearization, thus avoids the problem of zeroes and bias.

Thus, following Santos Silva and Tenreyro (2006), we estimate the gravity model using PPML estimator:

$$Trade_{ijt}^{k}=\alpha GRAV_{g}^{\gamma_g}\varepsilon^{EF_f\delta_f}, \tag{7}$$

with $Trade_{ijt}^{k}$ is the trade volume in million USD (constant 2000 USD) between exporting country *i* and importing country *j* for commodity *k* in year *t*. The yearly dataset for bilateral trade is constructed from the Customs Administration of Iran for its 33 major partners by commodity groups following the HS classification during 1992-2015. More information has been represented in Table A1 in the Appendix, where the sum of export and import data (trade) in any commodity sections have been used to measure the trade flow between country-pair.

The standard gravity variables have been including GRAV matrix. The log GDP of the exporting country (LnGDP_i) and log GDP of the importing country (LnGDP_j) have been provided from World Development Indicators (WDI). The other explanatory variables are the log of the weighted distance between the country-pair (LnD_{ij}) from the data set of Mayer and Zignago (2011), a dummy variable taking the value of one if the partner is landlocked (landlocked), a dummy variable taking the value of one if the partner is in Asia (continent), a dummy variable taking the value of one if Iran and its partner have the same language (comlang), and a dummy variable taking the value of one if the two

countries in the country-pair are contiguous (comborder). More details about variables have been represented in table A2 in the appendix.

Also, Disdier and Head (2008) argue that the distance effect is rather constant after a rise around the mid-twentieth century. Frankel (1997), Soloaga and Winters (2001), Berthelon and Freund (2008), among others, obtain evidence for an increasing distance effect, whereas Boisso and Ferrantino (1993), Eichengreen and Irwin (1998), Brun *et al*. (2005), Felbermayr and Kohler (2006), Coe *et al*. (2007), observe a negative evolution in the distance effect over time. There are several possible explanations for these contradictory results. Brun *et al*. (2005) argue that infrastructure is responsible for the decline of the distance effect. According to Felbermayr and Kohler (2006), the non-decreasing distance effect found in previous studies can be explained by the fact that these studies do not take into account the extensive margin of trade. Finally, Berthelon and Freund (2008) show that the increase of the overall distance coefficient is due to the changes in distance coefficients across industries. They explore two possible reasons for these changes. First, in some industries, goods have become more substitutable. Second, trade costs have changed too. The author argues that the first phenomenon is the most important one.

Moreover, the key elements of trade costs are international policy barriers (both tariff and non-tariff), transportation costs (freight and time), and distribution costs. Also, Anderson and van-Wincoop (2004) mentioned that trade costs are large, even aside from trade-policy barriers and even between apparently highly integrated economies. Since the globalization of trade these days is closely associated with the international fragmentation of production, the transportation costs are of very importance. Also, the regional integration agreements have employed by many developing countries about a promotion of trade, a general reduction of tariff rates, and the adoption of outward-oriented strategies. As a consequence, international transportation has achieved even

greater importance, and may exactly be considered one of the pillars of the global economy.

Hence, the paper tries to calculate the border effects on commodity groups' trade among Iran and its 33 major partners using two alternative approaches. In the first specification, the weighted distance variable has been considered as a proxy for the border effects and, the international trade costs (Ln$Cost_{ij}$) between Iran and its 33 major partners have been replaced in the alternative specification. These regressions will be estimated for all commodity sections in the next section.

5. ESTIMATION RESULTS

The estimated results for the gravity equation have been presented for 21 commodity groups' trade among Iran its 33 major partners during 1992-2015 in tables 4 and 5, where the distance (LnD_{ij}) and the international trade costs (Ln$Cost_{ij}$) are as a proxy for border effects. As mentioned in the previous section, the dependent variable is a total trade (sum of export and import) in any commodity sections among Iran and its partners.

Generally, the Pseudo Log-likelihood and R^2 show that the results in both tables 4 and 5 are acceptable and reliable for all commodity sections except for section 19 (including Arms & Ammunition Commodities). Also, the coefficients of the variables are usually consistent with theoretical expectation. Since the main aim of the paper is about the border effects, we will focus on the coefficients of the distance and international trade cost variables as a proxy for border effect.

The elasticity coefficients of distance for all commodity sections are statistically significant except for section 1 and 4. However, this variable has not theoretical sign for sections 3, 9, 10 and 14. This fact shows that trade is these

Table 4 The Gravity Equation for 21 Commodity Groups' Trade during 1992-2015 (Distance as Proxy for Border Effect)

Trade in Sections	Explanatory Variables								Border Effects	Diagnostic Test		Obs.
	Ln*GDP*$_i$	Ln*GDP*$_j$	Ln*D*$_{ij}$	*Landlocked*	*Continent*	*Comlang*	*Comborder*	Cons.		R^2	Pseudo-LR	
11	1.99*** (0.17)	–0.20** (0.11)	–0.43 (0.55)	–2.43*** (0.31)	–1.61*** (0.45)	1.19*** (0.45)	1.32*** (0.66)	–7.80**	0.65	0.45	–12,250	669
22	1.41*** (0.10)	0.05 (0.08)	–0.40** (0.22)	–0.55* (0.39)	–1.03*** (0.22)	–0.78*** (0.23)	0.90*** (0.43)	–4.02** (2.15)	0.67	0.45	–58,620	669
33	1.03*** (0.15)	0.25*** (0.11)	1.75*** (0.27)	–0.05 (0.31)	–0.97*** (0.39)	0.58** (0.32)	2.71*** (0.49)	–22.13*** (2.80)	—	0.10	–21,553	669
44	1.23*** (0.11)	0.11 (0.08)	–0.45 (0.36)	–0.25 (0.37)	–1.18*** (0.30)	1.12*** (0.27)	0.88* (0.53)	–3.45 (2.91)	0.64	0.40	–29,923	669
55	1.15*** (0.15)	0.17*** (0.07)	–0.91*** (0.16)	–2.13*** (0.20)	0.50 (0.39)	1.49*** (0.30)	–0.27 (0.46)	1.13 (2.02)	0.40	0.13	–111,778	669
66	1.10*** (0.13)	0.07 (0.06)	–0.76*** (0.18)	–0.97*** (0.19)	0.43*** (0.20)	1.53*** (0.30)	–1.53*** (0.35)	1.82 (1.89)	0.47	0.16	–74,871	669
77	1.16*** (0.16)	0.25*** (0.76)	–0.53*** (0.14)	–1.94*** (0.13)	0.89*** (0.26)	1.52*** (0.24)	–0.22 (0.32)	–3.27** (1.78)	0.59	0.14	–51,737	669
88	0.43*** (0.22)	–0.13** (0.76)	–0.65*** (0.21)	–2.40*** (0.27)	–0.41*** (0.18)	–2.78*** (0.44)	0.10 (0.38)	4.78*** (2.52)	0.52	0.05	–5,174	669
99	1.41*** (0.17)	0.21*** (0.09)	0.61*** (0.16)	–1.11*** (0.43)	0.34* (0.25)	–1.73*** (0.34)	2.42*** (0.40)	–17.39*** (1.40)	—	0.34	–6,556	669
10	0.72*** (0.11)	0.39*** (0.06)	0.55*** (0.15)	–0.52*** (0.24)	–0.24 (0.26)	–0.73*** (0.22)	1.83*** (0.34)	–11.19*** (1.63)	—	0.26	–14,662	669
111	–0.23** (0.13)	0.47*** (0.47)	–1.28*** (0.16)	–0.97*** (0.14)	0.54*** (0.11)	3.07*** (0.26)	–0.95*** (0.29)	11.77*** (2.01)	0.28	0.18	–21,749	669

212	0.59*** (0.14)	0.01 (0.06)	−2.60*** (0.21)	−1.13*** (0.13)	1.18*** (0.29)	2.21*** (0.27)	−1.04*** (0.33)	15.21*** (2.17)	0.07	0.79	−1,320	669
313	0.71*** (0.13)	0.33*** (0.06)	−2.18*** (0.23)	−1.63*** (0.12)	1.07*** (0.18)	2.57*** (0.32)	−1.81*** (0.27)	11.50*** (2.24)	0.11	0.68	−8,824	669
114	0.73 (0.57)	1.21*** (0.30)	3.02*** (0.77)	3.53*** (0.83)	−3.54*** (1.12)	−4.55*** (0.91)	8.46*** (1.19)	−37.96*** (5.60)	—	0.13	−12,301	669
115	0.74*** (0.10)	0.25*** (0.54)	−0.32*** (0.12)	−1.46*** (0.17)	−0.07 (0.23)	0.81*** (0.24)	0.54** (0.31)	−0.50 (1.44)	0.73	0.28	−93,928	669
116	0.28*** (0.14)	0.49*** (0.07)	−0.75*** (0.15)	−1.88*** (0.13)	−0.01 (0.19)	1.39*** (0.32)	−0.54** (0.32)	5.12*** (1.77)	0.47	0.20	−154,381	669
117	0.23* (0.16)	0.52*** (0.09)	−0.61*** (0.16)	−2.76*** (0.20)	0.36* (0.25)	2.35*** (0.38)	−0.24 (0.42)	−2.49 (2.14)	0.54	0.12	−52,329	669
118	0.25*** (0.12)	0.71*** (0.09)	−0.38*** (0.16)	−0.92*** (0.17)	−0.44*** (0.19)	−1.55*** (0.47)	0.16 (0.38)	−2.25 (2.02)	0.68	0.32	−13407	669
119	na	na	na	na	na	na	na	na	na	na	na	na
220	0.67 (0.56)	0.12 (0.14)	−0.61*** (0.31)	−1.58*** (0.17)	0.45*** (0.24)	0.86* (0.64)	−0.31 (0.49)	0.16 (6.06)	0.54	0.04	−7,523	669
221	1.13*** (0.22)	0.56*** (0.12)	−0.01 (0.19)	−3.40*** (0.64)	0.21 (0.26)	0.52 (1.22)	−1.21*** (0.41)	−10.90*** (2.60)	0.99	0.10	−33,593	669

Notes: ***, **, * indicate significance at 1%, 5%, and 10%, respectively and figures at partners are the standard deviations.

Table 5 The Gravity Equation for 21 Commodity Groups' Trade during 1992-2015 (Trade Cost as Proxy for Border Effect)

Trade in Sections	Explanatory Variables								Border Effects	Diagnostic Test		Obs.
	LnGDP_i	LnGDP_j	Ln$Cost_{ij}$	*Landlocked*	*Continent*	*Comlang*	*Comborder*	Cons.		R^2	Pseudo-LR	
11	1.96*** (0.17)	–0.18 (0.11)	–5.01 (3.77)	–1.53*** (0.41)	1.01** (0.59)	137*** (0.48)	–2.51*** (0.28)	–0.75 (7.81)	0.007	0.49	–11,988	669
22	1.41*** (0.10)	0.05 (0.08)	–2.82** (1.57)	–1.05*** (0.21)	0.94*** (0.42)	–0.79*** (0.24)	–0.55* (0.39)	–1.32 (3.65)	0.06	0.45	–58,697	669
33	1.04*** (0.15)	0.21** (0.12)	13.69*** (2.29)	–1.01*** (0.41)	2.65*** (0.48)	0.50 (0.32)	–0.08 (0.31)	–36.35*** (4.81)	–	0.10	–21,946	669
44	1.22*** (0.11)	0.12 (0.08)	–4.33* (2.59)	–1.15*** (0.28)	0.71 (0.50)	1.23*** (0.28)	–0.30 (0.36)	–2.00 (5.32)	0.013	0.41	–29,689	669
55	1.15*** (0.14)	0.17*** (0.76)	–7.04*** (1.17)	0.47 (0.39)	–0.28 (0.46)	1.55*** (0.30)	–2.16*** (0.20)	8.58*** (3.07)	0.001	0.13	–111,121	669
66	1.11*** (0.14)	0.05 (0.06)	–5.33*** (1.31)	–0.37** (0.19)	–1.43*** (0.34)	1.50*** (0.30)	–0.96*** (0.19)	–6.86*** (3.11)	0.005	0.16	–75,378	669
77	1.15*** (0.16)	0.25*** (0.08)	–4.32*** (1.04)	–0.88*** (0.26)	–0.24 (0.32)	1.57*** (0.25)	–1.97 (0.13)	1.42 (2.74)	0.013	0.14	–51,564	669
88	0.45*** (0.21)	–0.15*** (0.07)	–4.00*** (1.53)	–0.48*** (0.18)	0.27 (0.36)	–2.83*** (0.43)	–2.37*** (0.26)	7.93*** (3.87)	0.67	0.05	–5,203	669
99	1.41*** (0.17)	0.21*** (0.10)	4.65*** (1.27)	0.35 (0.25)	2.40*** (0.40)	–1.75*** (0.35)	–1.08* (0.43)	–22.21*** (2.50)	–	0.34	–6,548	669
10	0.72*** (0.11)	0.39*** (0.06)	4.31*** (1.19)	–0.23 (0.26)	1.83*** (0.34)	–0.76*** (0.22)	–0.52*** (0.24)	–15.74*** (2.61)	–	0.25	–14,655	669
111	–0.23** (0.13)	0.46*** (0.46)	–9.40*** (1.18)	0.47*** (0.11)	–0.86*** (0.27)	3.09*** (0.27)	–0.98*** (0.14)	21.10*** (3.13)	8.27E-05	0.18	–21,776	669

212	0.59*** (0.14)	–0.00 (0.06)	–18.6*** (1.39)	1.08*** (0.29)	–0.89*** (0.33)	2.27*** (0.27)	–1.13*** (0.13)	33.27*** (3.34)	8.35E-09	0.79	–1,293	669
313	0.71*** (0.14)	0.30*** (0.06)	–15.9*** (1.54)	0.94*** (0.17)	–1.67*** (0.25)	2.61*** (0.31)	–1.65*** (0.12)	27.25*** (3.57)	1.24E-07	0.69	–8,674	669
114	0.10 (0.57)	1.15*** (0.29)	24.17*** (6.30)	–3.74*** (1.16)	8.63*** (1.28)	–4.71*** (0.91)	3.52*** (0.81)	–63.59*** (12.03)	0.089	0.14	–12,282	669
115	0.74*** (0.10)	0.25*** (0.54)	–2.42*** (0.90)	–0.08 (0.23)	0.56** (0.30)	0.82*** (0.25)	–1.46** (0.18)	1.93 (2.19)	0.003	0.28	–93,950	669
116	0.28*** (0.14)	0.49*** (0.07)	–5.81*** (1.13)	–0.03 (0.19)	–0.55* (0.31)	1.43*** (0.32)	–1.89** (0.13)	11.26*** (2.82)	0.004	0.20	–154,285	669
117	0.22* (0.16)	0.53*** (0.10)	–5.43*** (1.21)	0.39* (0.24)	–0.36 (0.41)	2.44*** (0.38)	–2.80*** (0.20)	8.90*** (3.20)	0.07	0.12	–52,097	669
118	0.24*** (0.12)	0.71*** (0.10)	–3.17*** (1.26)	–0.44*** (0.18)	0.11 (0.37)	–1.52*** (0.48)	–0.93 (0.17)	1.32 (3.15)	0.042	0.32	–13,398	669
119	na	na	na	na	na	na	na	na	na	na	na	na
220	0.66 (0.56)	0.12 (0.13)	–4.83*** (2.25)	0.44** (0.24)	–0.33 (0.48)	0.90* (0.64)	–1.60*** (0.17)	5.38 (8.19)	0.008	0.03	–7,512	669
221	1.13*** (0.22)	0.56*** (0.13)	–0.02 (1.61)	0.20 (0.26)	–1.19*** (0.41)	0.52 (1.22)	–3.40*** (0.64)	–10.98*** (4.07)	0.98	0.10	–33,593	669

Notes: ***, **, * indicate significance at 1%, 5%, and 10%, respectively and figures at partners are the standard deviations.

sections is not normally affected by distance and other factors are as determinants for trade in these sections, such as consumer tastes for section 3. According to the results, the highest effect of distance on bilateral trade has been revealed in sections 12, 13 and 11. Hence, these sections are significantly affected by distance and the border effect is important for the trade of them than other sectors. On the other hand, this index is lowest for sections 21. Note that to compute the border effects, we take exponents the distance coefficient effects for commodity sections.

Also, the results in table 5 indicate that the coefficients of international trade cost are statistically significant for all commodity sections except for sections 1 (Live Animals) and 2 (Vegetable Products). As well as the results in table 4, the coefficients of these variables have not theoretically sign in sections 3 (Animal or Vegetable Fats & Oils), 9 (Wood & Articles of Wood), 10 (Pulp of Wood or other Fibrous Cellulosic Material Recovered (Waste & Scrap) Paper) and 14 (Natural or Cultured Pearls, Precious or Semi-Precious Stone). Moreover, by comparing the coefficients of international trade cost with the distance coefficients, the results show that they are absolutely greater. Now, to compute the border effects, we take exponents the trade cost coefficient for commodity sections. Again the results show that sections 12 (Footwear, Headgear, Umbrellas, Walking-sticks), 13 (Articles of Stone, Plaster, Cement) and 11 (Textiles & Textile Articles) have absolutely the highest coefficients and border effects for these sections are significant, and this index is lowest for section 21 (Works of Art, Collectors, Pipes & Antiques).

Finally, to introduce some policy implications for promoting bilateral trade flows between Iran and Korea, this study tries to rank potential trade for commodity groups. In this regard, five measures have been used as follows:

- ✓ Unit Value Index,
- ✓ Export-Import Similarity Indices (Cosin and FK),

- ✓ Intra-Industry Trade,
- ✓ Horizontal Intra-Industry Trade,
- ✓ Border Effect Indices (introduced in estimation results).

The results have been represented in figure 2 and 3. The critical value for α is 15% in both figures to determine horizontal intra-industry trade, while the measure of border effect in figure 2 and 3 is selected from the results of table 4 and 5, respectively.

According to the results, both figure 2 and 3 indicate that sections 6 (Products of the Chemical or Allied Industries), 4 (Prepared Food Stuff, Beverages) and 15 (Base Metals & Articles of Base Metal) have the highest rank to promote potential trade between Iran and Korea and it is an important policy implication for policymakers, and they have to consider special programs in these sections.

Figure 2 Ranking Potential Trade of Commodity Groups between Iran and Korea (Distance as Proxy for Border Effects)

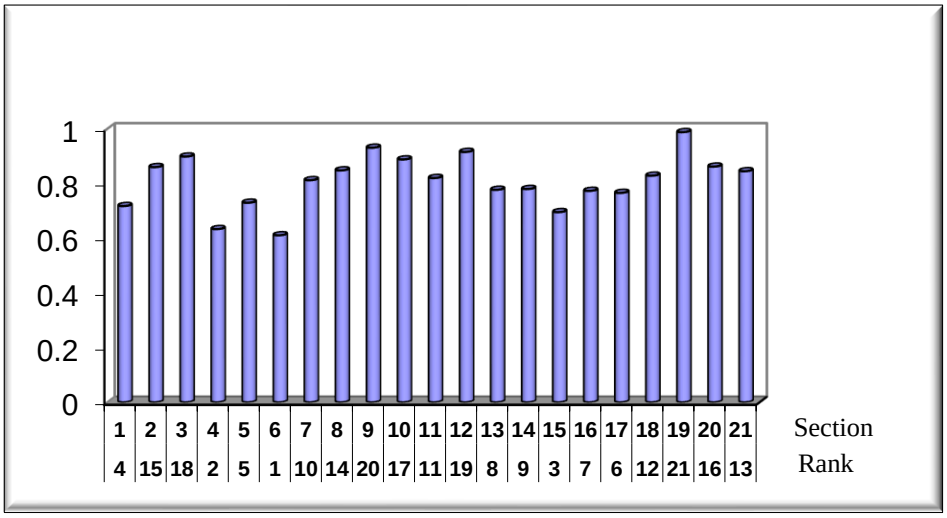
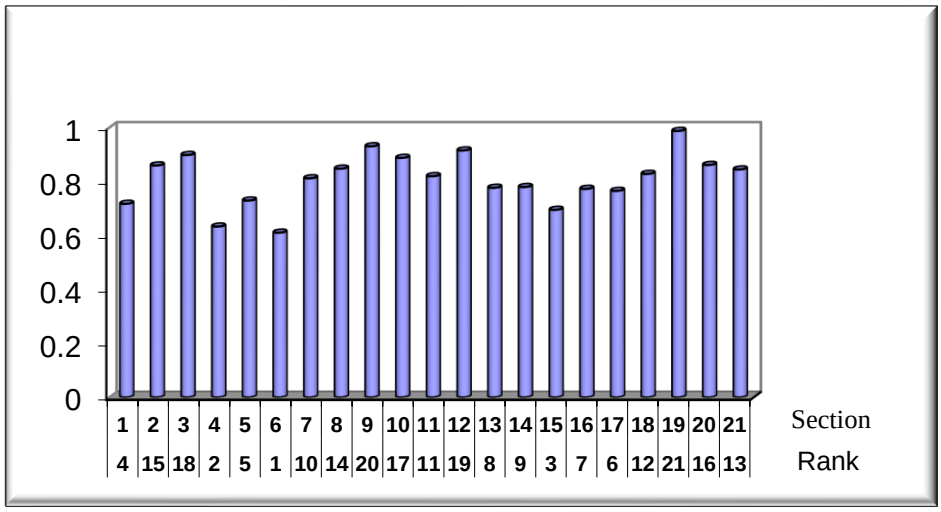


Figure 3 Ranking Potential Trade of Commodity Groups between Iran and Korea (Trade Cost as Proxy for Border Effects)



6. CONCLUSION AND POLICY IMPLICATION

The paper tried to review the historical data of Iran's international trade, especially focusing on the bilateral trade relations between Iran and Korea, and the determinants of bilateral trade among Iran and its major partners have been evaluated with emphasizing on Border Effects using the relevant disaggregated data of trading commodities. Finally, this study tried to rank potential trade for commodity groups between Iran and Korea. The disaggregated data for bilateral trade on commodity groups among Iran and its 33 major partners have been used during 1992-2015. Some measure such as export-import similarity index, inter and intra-industry trade index, horizontal and vertical intra-industry trade index was employed to achieve the purposes of this paper. Additionally, the specified gravity model was estimated by the PPML approach.

During 1992-2015, the results indicate that A) Korea is a major partner for Iranian trade flows, B) the unit value index is highest in section 18, C) the Cosin and FK similarity indices show that potential trade is low between Ian and Korea in all Commodity groups, D) the results for intra and inter-industry trade indicated that trade in some sections has more intra-industry pattern such as section 7 and in some sections has inter-industry pattern such as section 14 (Natural or Cultured Pearls, Precious or Semi-Precious Stone). However, the average GL measure for all commodity groups is low. E) The major parts of intra-industry trade between Iran and Korea were vertical in all commodity groups. F) The estimated results of gravity model show that border effects have had the highest effect on commodity sections 12 (Footwear, Headgear, Umbrellas, Walking-sticks), 13 (Articles of Stone, Plaster, Cement) and 11 (Textiles & Textile Articles) according to the distance and international trade costs. G) Finally, the potential trade ranks in commodity groups represented that sections 6 (Products of the Chemical or Allied Industries), 4 (Prepared Food Stuff, Beverages) and 15 (Base Metals & Articles of Base Metal) have the highest rank to promote bilateral trade between Iran and Korea.

The empirical results implied that initiating an export development strategy in the highest rank commodity groups can lead to a bilateral agreement and preferential tariffs between Iran and Korea. Moreover, by emphasizing on horizontal intra-industry trade, foreign direct investment (including joint-venture, technology transfer, …) can be conducted between Iran and Korea while both countries can move toward some outsourcing agreements. Finally, more cooperation in the maritime industry to reduce Border Effects is expressible.

APPENDIX

Table A1 Commodity Sections and Their Information

Section	Name	Chapters
11	Live Animals	01-05
22	Vegetable Products	06-14
33	Animal or Vegetable Fats & Oils	15
44	Prepared Food Stuff, Beverages	16-24
55	Mineral Products	25-27
66	Products of the Chemical or Allied Industries	28-38
77	Plastics & Articles Thereof	39-40
88	Raw Hides & Skins, Leather	41-43
99	Wood & Articles of Wood	44-46
10	Pulp of Wood or other Fibrous Cellulosic Material Recovered (Waste & Scrap) Paper	47-49
111	Textiles & Textile Articles	50-63
212	Footwear, Headgear, Umbrellas, Walking-sticks	64-67
313	Articles of Stone, Plaster, Cement	68-70
114	Natural or Cultured Pearls, Precious or Semi-Precious Stone	71
115	Base Metals & Articles of Base Metal	72-83
116	Machinery & Mechanical Appliances, Electrical Equipment	84-85
117	Vehicles, Aircraft, Vessels & Associated Transport Equipment	86-89
118	Optical, Photographic, Cinematographic, Measuring	90-92
119	Arms & Ammunition	93
220	Miscellaneous Manufactured Articles	94-96
221	Works of Art, Collectors, Pipes & Antiques	97-98

Table A2 Variables Information

Variable	Symbol	Definition	Source
Export	X_{ijt}^{k}	Export value of commodity *k* between countries *i* and *j*, Million US Dollar	Customs Administration, Iran
Import	M_{ijt}^{k}	Import value of commodity *k* between countries *i* and *j*, Million US Dollar	Customs Administration, Iran
Trade	$Trade_{ijt}^{k}$	Trade value of commodity *k* between countries *i* and *j*, Million US Dollar	Customs Administration, Iran
GDP_i	LnGDP_i	Log GDP of the exporting country	WDI
GDP_j	LnGDP_j	Log GDP of the importing country	WDI
Distance	LnD_{ij}	Log weighted distance between the country-pair	Mayer and Zignago (2011)
Trade Cost	Ln$Cost_{ij}$	Log International Trade Costs	WDI
Land Locke	*landlocked*	Dummy variable taking the value of one if the partner is landlocked.	Mayer and Zignago (2011)
Continent	*continent*	dummy variable taking the value of one if the partner is in Asia	Mayer and Zignago (2011)
Common Language	*comlang*	Dummy variable taking the value of one if Iran and its partner have the same language	Mayer and Zignago (2011)
Contiguous	*comborder*	Dummy variable taking the value of one if the two countries in the country-pair are contiguous	Mayer and Zignago (2011)

REFERENCES

Anderson, J. E., "A Theoretical Foundation for the Gravity Equation," *American Economic Review,* 69(1), 1979, pp. 106-116.

Anderson, J. E. and E. van Wincoop, "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review,* 93(1), 2003, pp. 170-192.

_____, "Trade Costs," *Journal of Economic Literature,* 42(3), 2004, pp. 691-751.

Baier, S. and J. H. Bergstrand, "The Growth of World Trade: Tariffs, Transport Costs, and Income Similarity," *Journal of International Economics,* 53(1), 2001, pp. 1-27.

Baltagi, B., P. Egger, and M. Pfaffermayr, "Panel Data Gravity Models of International Trade," CESIFO Working Paper No. 4616, 2014.

Bergstrand, J. H., "The Gravity Equation in International Trade: Some Microeconomic Foundation and Empirical Evidence," *The Review of Economics and Statistics*, 67, 1985, pp. 474-481.

_____, "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade," *The Review of Economics and Statistics,* 71(1), 1989, pp. 143-153.

_____, "The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-industry Trade," *The Economic Journal,* 100(403), 1990, pp. 1216-1229.

Berthelon, M. and C. Freund, "On the Conservation of Distance in International Trade," *Journal of International Economics,* 75(2), 2008, pp. 310-320.

Blum, B. S. and A. Goldfarb, "Does the Internet Defy the Law of Gravity?" *Journal of International Economics,* 70(2), 2006, pp. 384-405.

Boisso, D. and M. Ferrantino, "Is the World Getting Smaller? A Gravity Export Model for the Whole Planet World," Working Papers 9225, Richard Johnson Center Working Paper, Southern Methodist University, 1993.

Brun, J. F., C. Carrere, P. Guillaumont, and J. de Melo, "Has Distance Died? Evidence from a Panel Gravity Model," *The World Bank Economic Review,* 19(1), 2005, pp. 99-120.

Buch, C. M., J. Kleinert, and F. Toubal, "The Distance Puzzle: On the Interpretation of the Distance Coefficient in Gravity Equations," *Economics Letters*, 83(3), 2004, pp. 293-298.

Chen, N., "Intra-National Versus International Trade in the European Union: Why Do National Borders Matter?" *Journal of International Economics*, 63, 2004, pp. 93-118.

Chor, D., "Unpacking Sources of Comparative Advantage: the Quantitative Approach," *Journal of International Economics*, 82(2), 2010, pp. 152-167.

Coe, D. T., A. Subramanian, and N. T. Tamirisa, "The Missing Globalization Puzzle: Evidence of the Declining Importance of Distance," *IMF Staff Papers*, 54(1), 2007, pp. 34-58.

Combes, P. P., M. Lafourcade, and T. Mayer, "The Trade-creating Effects of Business and Social Networks: Evidence from France," *Journal of International Economics*, 66(1), 2005, pp. 1-29.

Coughlin, C. C. and D. Novy, "Is the International Border Effect Larger than the Domestic Border Effect? Evidence from U.S. Trade," Discussion Papers 09/29, University of Nottingham, GEP., 2012.

Deardoff, A., "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?" Working Papers 382, Research Seminar in International Economics, University of Michigan, 1995.

Disdier, A. and K. Head, "The Puzzling Persistence of the Distance Effect on Bilateral Trade," *The Review of Economics and Statistics,* 90(1), 2008, pp. 37-48.

Eaton, J. and S. Kortum, "Technology, Geography, and Trade," *Econometrica*, 70(5), 2002, pp. 1741-1779.

Eichengreen, B. and D. A. Irwin, "The Role of History in Bilateral Trade Flows," NBER Chapters in: *The Regionalization of the World Economy,* 1998, pp. 33-62

Feenstra, R. C., "Border Effect and The Gravity Equation: Consistent Method for Estimation," *Scottish Journal of Political Economy,* 49(5), 2002, pp. 491-506.

_____, *Advanced International Trade: Theory and Evidence*, 2, Princeton University Press, 2016.

Felbermayr, G. J. and W. Kohler, "Exploring the Intensive and Extensive Margins of World Trade," *Review of World Economics,* 142(4), 2006, pp. 642-674.

Felbermayr, G. and J. Gröschl, "Within U.S. Trade and the Long Shadow of the American Secession," *Economic Inquiry,* 52(1), 2014, pp. 382-404.

Fontagné, L. and M. Freudenberg, "Intra-Industry Trade: Methodological Issues Reconsidered," CEPII Working Paper 97/02, Paris: Centre d'Etudes Prospectives et d'Informations Internationales, 1997.

Frankel, J., *Regional Trading Blocs in the World of Economic System*, Washington, D.C.: Institute for International Economics, 1997.

Garmendia, A., C. Llano-Verduras, and F. Requena-Silventre, "Network and the Disappearance of the International Home Bias," *Economic Letters,* 116, 2012, pp. 178-182.

Greenaway, D. and C. Milner, *The Economics of Intra-Industry Trade*, 1, Blackwell: Oxford, 1986.

Grubel, H. G. and P. J. Lioyd, "The Empirical Measurement of Intra-Industry Trade," *The Economic Record,* 47, 1971, pp. 494-517.

_____, "Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products," *The Economic Journal*, 339, 1975, pp. 646-648.

Harris, M. and L. Matyas, "A Comparative Analysis of Different IV and GMM Estimators of Dynamic Panel Data Models," *International Statistical Review,* 72, 2004, pp. 397-408.

Harris, M., W. Kostenko, M. Matyas, and I. Timol, "The Robustness of Estimators for Dynamic Panel Data Models to Misspecification," *Sin. Economic Review,* 51, 2009, pp. 399-426.

Head, K. and T. Mayer, "Non-Europe: The Causes and Magnitudes of Market Fragmentation in the EU," *Weltwirtschaftliches Archiv*, 136, 2000, pp. 285-314.

_____, "Illusory Border Effects: Distance Mismeasurement Inflates Estimates of Home Bias in Trade," CEPII Working Paper, No. 2002-01, 2002.

_____, "Gravity Equations: Workhorse,Toolkit, and Cookbook," CEPII Working Paper, No. 2013-27, 2013.

Helliwell, J. F., "National Borders, Trade and Migration," NBER Working Papers 6027, National Bureau of Economic Research, Inc., 1997.

_____, *How Much Do National Borders Matter?* Washington, DC.: Brookings Institution Press, 1998.

Helpman, E. and P. R. Krugman, *Market Structure and Foreign Trade. Increasing Returns, Imperfect Competition, and the International Economy*, Cambridge: MA: MIT Press, 1996.

Helpman, E., M. Melitz, and Y. Rubinstein, "Estimating Trade Flows: Trading Partners and Trading Volumes," *The Quarterly Journal of Economics,* 123(2), 2008, pp. 441-487.

Hillberry, R. H., "Explaining the 'Border Effect': What Can We Learn from Disaggregated Commodity Flow Data?" Indiana University Graduate Student Economics Working Paper Series 9802, Indiana University, 1999.

_____, "Aggregation Bias Compositional Change, and the Border Effect," *Canadian Journal of Economics,* 35, 2002, pp. 517-530.

Hillberry, R. and D. Hummels, "International Home Bias: Some Explanations," *The Review of Economics and Statistics*, 85(4), 2003, pp. 1089-1092.

_____, "Trade Responses to Geographic Frictions: A Decomposition Using Micro-data," *European Economic Review*, 52, 2008, pp. 527-550.

Hummels, D., "Toward a Geography of Trade Costs," unpublished manuscript, Purdue University, 2002.

Krugman, P. R., "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review*, 70(5), 1980, pp. 950-959.

_____, "Increasing Returns and Economic Geography," *Journal of Political Economy*, 99(3), 1991, pp. 483-499.

Leamer, E. E., "U.S. Manufacturing and an Emerging Mexico," *The North American Journal of Economics and Finance*, 4(1), 1993, pp. 51-89.

_____, "A Flat World, a Level Playing Field, a Small World After All, or None of the Above? A Review of Thomas L Friedman's The World is Flat," *Journal of Economic Literature*, 45(1), 2007, pp. 83-126.

Levchenko, A. A., "Institutional Quality and International Trade," *The Review of Economic Studies*, 74(3), 2007, pp. 791-819.

Limao, N. and A. J. Venables, "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade," *World Bank Economic Review*, 15(3), 2001, pp. 451-479.

Linnemann, H., *An Econometric Study of International Trade Flows*, Amsterdam: North Holland Publishing Company, 1966.

Márquez-Ramos, L., I. Martínez-Zarzoso, E. Pérez-García, and G. Wilmsmeier, "Factores Determinantes del Flete: Análisis para el Caso Español," in J. M. Menéndez-Martínez, B. Guirao-Abad, and A. Rivas-Álvarez, eds., *Actas del VII Congreso de Ingeniería del Transporte*, *1Edición*, ANGAMA Artes Gráficas, 2006.

Mayer, T. and S. Zignago, "Notes on CEPII's Distances Measures: the GeoDist Database," CEPII Working Paper 2011-25, 2011.

McCallum, J., "National Borders Matter: Canada- U.S. Regional Trade Patterns," *American Economic Review*, 85(3), 1995, pp. 615-623.

Millimet, D. L. and T. Osang, "Do State Borders Matter for U.S. International Trade? The Role of History and Internal Migration," *Canadian Journal of Economics*, 40(1), 2007, pp. 93-126.

Nitsch, V., "National Borders and International Trade: Evidence from the European Union," *Canadian Journal of Economics*, 33(4), 2000, pp. 1091-1105.

Nitsch, V. and N. Wolf, "Tear Down this Wall: On the Persistence of Borders in Trade," *Canadian Journal of Economics*, 46(1), 2013, pp. 154-179.

Novy, D., "International Trade without CES: Estimating Translog Gravity," *Journal of International Economics*, 89(2), 2013, pp. 271-282.

Obstfeld, M. and K. Rogoff, "The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?" *NBER Macroeconomics Annual 2000*, 15, 2001, pp. 339-412.

Pöyhönen, P., "A Tentative Model for the Volume of Trade between Countries," *Weltwirtschaftliches Archiv*, 90, 1963, pp. 93-99.

Radelet, S. and J. Sachs, "Shipping Costs, Manufactured Exports and Economic Growth," Harvard University, Harvard Institute for International Development. Mimeographed document, Harvard, MA: USA., 1998.

Romalis, J., "Factor Proportions and the Structure of Commodity Trade," *American Economic Review*, 94(1), 2004, pp. 67-97.

Rose, A. K. and E. van Wincoop, "National Money as a Barrier to International Trade: The Real Case for Currency Union," *American Economic Review*, 91(2), 2001, pp. 386-390.

Santos Silva, J. M. C. and S. Tenreyro, "The Log of Gravity," *The Review of Economics and Statistics*, 88(4), 2006, pp. 641-658.

Soloaga, I. and L. A. Winters, "Regionalism in the Nineties: What Effect on Trade?" *The North American Journal of Economics and Finance*, 12(1), 2001, pp. 1-29.

Suárez-Burguet, C., I. Martínez-Zarzoso, and L. Márquez-Ramos, "The Non-linear Specification of the Gravity Model: An Empirical Application on International Trade," *PD-ECO 2005/1. Castellón, Spain, Universitat Jaume I.*, 2005.

Tinbergen, J., "The World Economy," *Suggestions for an International Economic Policy*, New York: Twentieth Century Fund, 1962.

Wei, S., "Intra-National Versus International Trade: How Stubborn are Nations in Global Integration?" NBER Working Paper 5531, 1996.

Wolf, H. C., "International Home Bias in Trade," *The Review of Economics and Statistics*, 82(4), 2000, pp. 555-563.

Yilmazkuday, H., "Understanding Interstate Trade Patterns," *Journal of International Economics*, 86(1), 2012, pp. 158-166.